Physical Activity in Aging Population

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Abstract

It is known that worldwide populations are aging, and also that physical activity can play an important role in minimizing impairments characteristic of old age. Adopting a more active lifestyle and doing regular physical activity, including aerobic and resistance exercises, daily walking etc. have been demonstrated to improve cardiovascular, respiratory, and musculoskeletal parameters in older adults. We assessed a potential participant from Elbasan (Albania), 67 years, for eligibility to participate in a 5 month training program. The subject gave written informed consent before inclusion.The following parameters were measured at the beginning (baseline) and end of the training period: BMI, body fat percentage, hand grip strength, lower/upper limb and trunk flexibility and range of motion, heart rate, balance, pain intensity, as well as VO2 max, directly and/or an estimate using the Rockport fitness test estimate. An initial evaluation was carried out just before starting the training (baseline). A second evaluation was made 5 months after starting the program of physical exercise (post training). Each evaluation included the recording of health related events, such as any changes in previous symptoms, as well as measurements of balance, flexibility, body composition, coordination, muscle strength, and aerobic capacity, to detect any changes that might have been induced specifically by physical activity. The subject's attendance and participation in the program was also recorded. Range of motion for each part evaluated (trunk, hip, cervical region and shoulder) is improved about 15-20° degree. BMI, hand grip strength, lower/upper limb and trunk flexibility, heart rate, balance, pain intensity, VO2 max are also improved after training program. Following a training program or a regular physical activity in older adults minimise impairments characteristics in this age and cardiovascular, respiratory, and musculoskeletal parameters. According to the low importance shown in my country for the physical activity in older adults, I want to emphasize the importance of state structures involvement and the sensibilization of this group of age to stimulate an actively participation in physical training programs followed by professionals for bests life parameters. A higher investment for this age group, building as many facilities as possible for activation and spending quality free time, hiring more physiotherapists in nursing homes will increase life motivation and improve the quality and the parameters of living.

Keywords: life parameters, older adults, physical activity, training program

Introduction

It is known that worldwide populations are aging, and also that physical activity can play an important role in minimizing impairments characteristic of old age. Adopting a more active lifestyle and doing regular physical activity, including aerobic and resistance exercises, daily walking etc. have been demonstrated to improve cardiovascular, respiratory, and musculoskeletal parameters in older adults. Occupational therapy, prescription of assistive devices, environmental, and home living adaptation, and family or caregiver educational training represent an essential rehabilitative strategy in elders developing disability. In these people, falls are dramatic events that lead to hospitalization, functional decline, decreased social activity, and poor quality of life. Rehabilitation incorporating balance, gait, and strength training exercise interventions can reduce the risk of falls. Indeed, a recent review (Weening Dijksterhuis, de Greef, Scherder, Slaets, & van der Schans, **2011**) concluded that there is strong evidence supporting the positive effects of exercise training on physical fitness, functional performance, performance in activities of daily living, and quality of life in even in frail individuals. Data available suggest that such physical exercise programs should contain a combination of progressive resistance, balance, and functional training, such as exercises to improve gait. Older adults should take part in at least 2.5 hours of moderate to vigorous activity each week. A walking program is an expensive, easy and convenient way to improve overall well-being and to enhance quality of life. Increasing physical activity through walking and physical exercising can help with decreasing blood pressure, decreasing systolic blood pressure, reducing the risk of coronary heart disease, reducing high cholesterol, improving bone density and joint flexibility.Strength and coordination training can reduce postural tremor amplitude in elderly individuals (Keogh, Morrison, & Barrett, **2010**). A program of multicomponent training with weight bearing exercises was found to improve bone density, muscle strength, and balance in older women (Marques et al., **2011**), this last point being especially important as balance is a prerequisite for mobility (Frank &Patla, **2003**). Furthermore, it has been shown that explosive resistance training enables older adults to reach higher peak power outputs with heavier loads without losses in movement velocity (de Vos et al., **2008**).

Stretching can be used as an effective means to improve range of motion and reverse some age related changes that influence gait performance. The results of another study (Batista, Vilar, de Almeida Ferreira, Rebelatto, &Salvini, **2009**) indicate that in older women an active stretching program is effective for increasing the flexibility of knee flexors, extensors and flexor torque, as well as functional mobility. Older adults with severe obesity usually show a greater impairment in mobility than those who are less obese, and it should be taken into account that even less obese individuals also show a significant decline in mobility (Hergenroeder et al., **2011**). Overall, physical exercise may help maintain a normal healthy weight, avoiding both excessive weight gain and loss. Aerobic exercise elicits a significant improvement in cardiorespiratory fitness in older individuals (Forster et al., **2009**). It has also been suggested that cycle ergometry is sufficient stimulus to improve neuromuscular function in older men, although gains may be quickly lost with detraining (Lovell, Cuneo, &Gass, **2010**). In summary, multicomponent physical activity programs have an important role to play in maintaining physical health and wellbeing among the elderly. At the same time, for such programs to be sustainable and reach as many of the target population as possible, it is clearly desirable to avoid complex costly programs.

Methodology

We assessed a potential participant from Elbasan (Albania), 67 years, for eligibility to participate in a 5month training program. The subject gave written informed consent before inclusion.The following parameters were measured at the beginning (baseline) and end of the training period: BMI, body fat percentage, hand grip strength, lower/upper limb and trunk flexibility and range of motion, heart rate, and balance, pain intensity, as well as VO2 max, directly and/or an estimate using the Rockport fitness test estimate.A physical condition assessment was performed before inclusion of older adult in the program, and its results were taken into account as a possible exclusion criterion. That is, it was necessary to ensure that the physical condition of the potential participant was sufficiently good to enable him to participate in the physical activity training carried out in this study, and thereby avoid unreasonable risks.An initial assessment was made using a questionnaire that recorded personal data, age, and other socio-demographic data. Subjects' degree of interest in and regular level of physical activity, as well as a detailed medical history, including pharmacological treatments, were also detailed. A physical examination of musculoskeletal system was performed, and heart rate and blood pressure were measured. All these data provided a general health evaluation to ensure early identification of any absolute or relative contraindications, or limitations on physical exercise.Given all this, the inclusion criteria were: have given written informed consent; have passed the medical examination, having the minimum physical condition to carry out the proposed exercise program and no absolute or relative contraindication to exercise or activity restrictions; to participate and to be assessed at least 80% of the training sessions.Exclusion criteria were based on reviewing past medical records like heart failure, acute myocardial infarction, myocarditis, angina pectoris, untreated severe hypertension, valvular heart disease, aortic aneurysm, pulmonary heart disease, heart rhythm disorders, vein occlusions, respiratory failure, psychosis, uncontrolled epilepsy or diabetes etc.

These static balance sessions were performed individually with the subject on a force measuring and balance training platform (Metitur Good Balance 200 System®, Metitur Ltd., Jyväskylä, Finland). The platform system converts changes in weight distribution to a quantitative measurement of medial-lateral and anterior-posterior sway over a certain period of time (Ceria Ulep et al., 2010): the larger the area, the poorer the balance. We assessed the subject standing first on a hard and then a foam surface for 15 and 30 second intervals.

Trunk flexibility: For this, we used the most common way to measure lower back and hamstring flexibility, namely, the sit and reach test (Osness et al., **1996**). The subject removed his shoes and sat on the floor with his legs stretched out in front of him with knees straight and feet flat against the front end of the test box. He was instructed to lean forward, in a slow, steady movement, bending at the hips, keeping hisknees straight and sliding his hand up the ruler as far as he was able to reach. When the subject has stretched forward as far as he can, the result is recorded (in cm); he was allowed to rest, and then repeat the test a further two times, that is, three times in total.

Muscle Strength: Hand grip strength was determined using a Jamar hydraulic hand dynamometer (Sammons Preston, Bolingbrook, IL). The hand dynamometer was first calibrated. The position for measuring the handgrip force was with the hand forward and elbow at a 90° angle. We then recorded the mean of three measurements of the force (using the maximum in each repetition) and always in the dominant hand in each participant.

Aerobic Capacity: $VO_{2\ max}$ was estimated using the Rockport fitness test (1609.3 m walk) and was also measured directly, when it was judged that this would not represent an unreasonable risk to the individual. The time to complete the walk and their final heart rate were measured. The value of $VO_{2\ max}$ was then calculated with the following equation: $VO_{2\ max} = 132.6 - (0.17 \times \text{body mass}) - (0.39 \times \text{age}) + (6.31 \times \text{sex}) - (3.27 \times \text{time in minutes}) - (0.156 \times \text{heart rate})$, where for sex, Male = 1 and Female = 0.

Range of motion

Range of motion in cervical segment, in trunk and in upper/lower extremities was evaluated using goniometer, an instrument which measures range of motion joint angles of the body.Example: Measuring hip flexion- patient in supine position; locate the greater trochanter of the femur and the lateral epicondyle of femur; place the center of the goniometer body over the greater trochanter; align the stationary arm with the lateral mid-line of the pelvis; align the moving arm with lateral epicondyle of femur; stabilize pelvis and have patient flex hip bringing thigh close to the trunk with knee bent; align moving arm with lateral epicondyle of femur an then read the angle.

Visual analogue scale for pain

The Visual Analogue Scale (VAS) consists of a straight line with the endpoints defining extreme limits such as ‘no pain at all’ and ‘pain as bad as it could be’. The subject is asked to mark his pain level on the line between the two endpoints. The distance between ‘no pain at all’ and the mark then defines the subject’s pain. This tool was first used in psychology by Freyd in 1923. If descriptive terms like ‘mild’, ‘moderate’, ‘severe’ or a numerical scale is added to the VAS, one speaks of a Graphic Rating Scale (GRS). There are given two body drawings (anterior and posterior view) to elicit pain localization. The subject has to put an (X) or (+) in the regions where he feels pain.

Physical activity program

It was ensured that the activity was carried out in suitable conditions. Specifically, there was proper lighting and ventilation, the room temperature being kept at 18–20°C, and a sufficiently large area. Sessions lasted at most 40 minutes, with three sessions a week. The subject was instructed to wear suitable cotton sports clothing. Each session began with a 5- to 7 minute period of stretching of the main muscle groups, followed by mobility and strength exercises lasting 15 minutes. Then, a slow walk commenced. The pace was progressively quickened to a run, and, after<1 minute running, the subject returned to a slow walk. Otherwise, the subject continued walking, increasing the length of their stride. In both cases, this aerobic exercise (walking/running) lasted for a total of about 3 minutes.

This was followed by a rest, with hydration (water or fruit juice). Subsequently, for a period of 15 minutes, coordination and balance exercises were performed with balls and other materials, combined with cooperative games (e.g., keeping a ball or balloon in the air). Finally, the session ended with breathing exercises and relaxation. The subject's heart rate was measured at the beginning of each session (resting heart rate) at the end of the session (heart rate after the aerobic exercise). An initial evaluation was carried out just before starting the training (baseline). A second evaluation was made 5 months after starting the program of physical exercise (post training). Each evaluation included the recording of health related events, such as any changes in previous symptoms, as well as measurements of balance, flexibility, body composition, coordination, muscle strength, and aerobic capacity, to detect any changes that might have been induced specifically by physical activity. The subject’s attendance and participation in the program was also recorded.

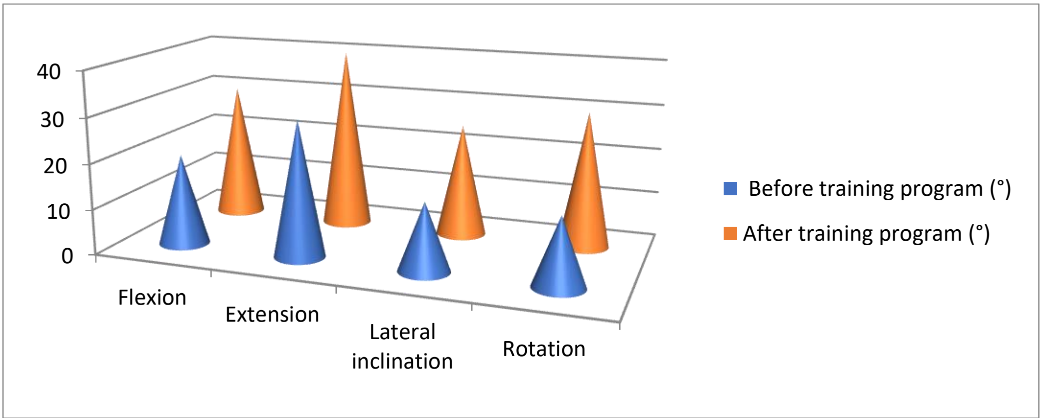
Statistical analysis

Table 1

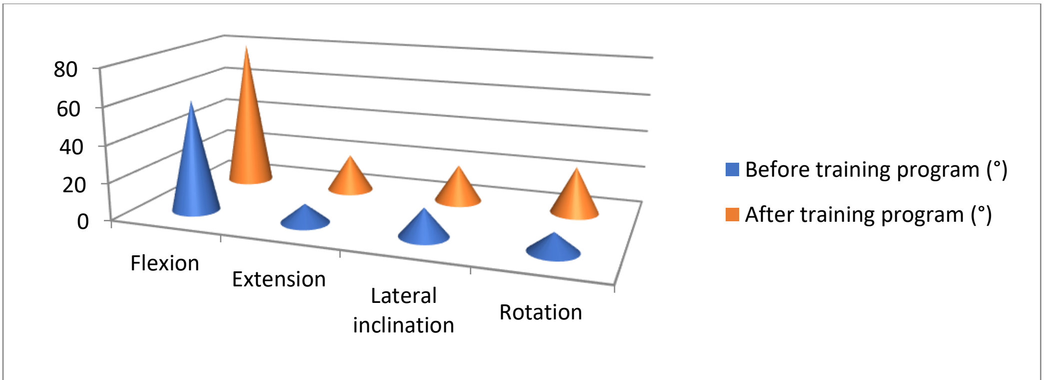
	Measurement 1 (before training program)	Measurement 2 (after training program)
BMI (kg/m²)	28.9	27.2
Hand grip force (kg)	0.51	0.67
Flexibility (cm)	14.2	17.3
Resting heart rate (beats per minute)	74.2	71.8
Heart rate after exercise (beats per minute)	100	93
Balance (mm²)	425.2	300.5
$VO_{2\ max}$ (mL/kg per minute)	21.5	20.8
Blood pressure	14.3/9.4	12.6/8.1

Range of motion

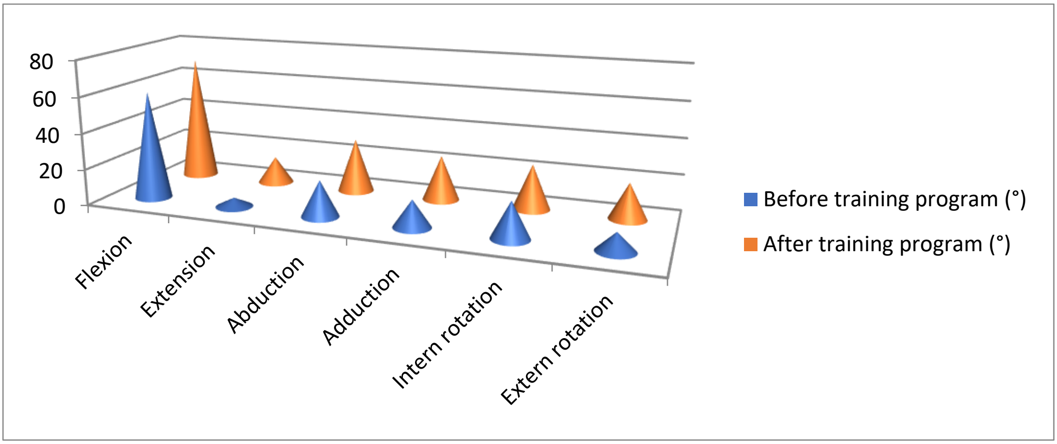
Cervical range of motion



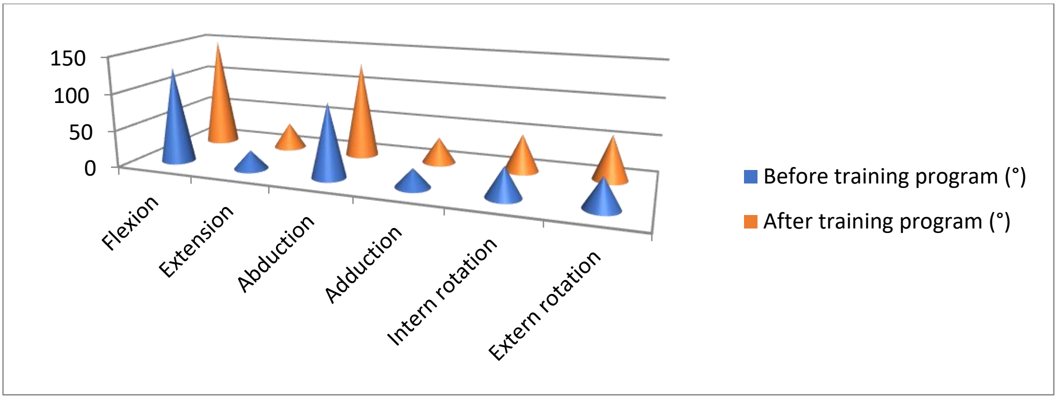
Thoraco-lumbar range of motion



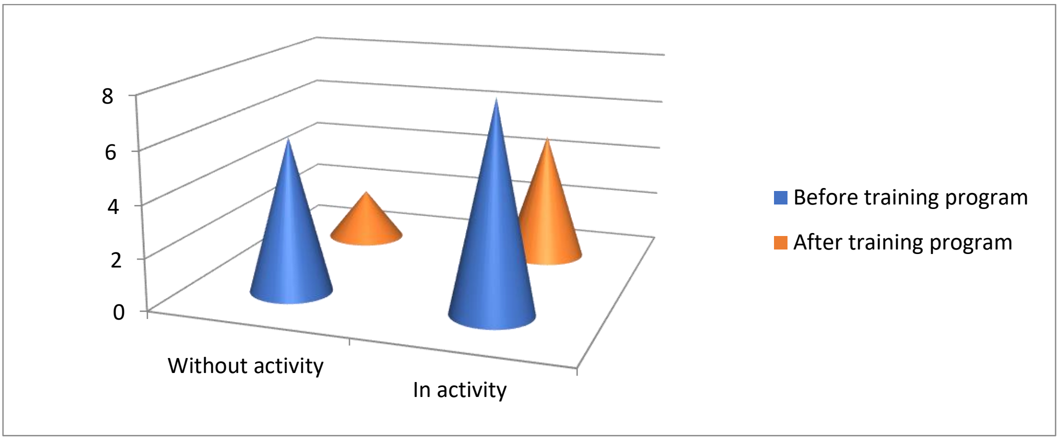
Hip range of motion



Shoulder range of motion



Visual analogue scale for pain



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